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Correlation of residual limb pain and phantom limb pain with Kinesiophobia in Patients of Amputation

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Abstract

Background: An amputation is defined as the removal of a part or all of a limb of the body due to trauma, vascular disease, infection, tumors, neurological disorders, congenital deformity, etc. Residual limb pain (stump pain) is the pain arising from the residual part of the body. It is commonly a sharp, sticking, or pressure feeling that, although diffuse, is localized to the end of the residual limb. Stump pain is caused by a number of pathologies, including vascular insufficiency, bony spurs, skin damage, and neuromas. PLP is a painful or unpleasant sensation in the distribution of the lost or defective body part and is characterized by pain such as sharp, shooting, or electrical-like, dull, squeezing, and cramping. Where the pain induces, the fear of movement is associated with a feeling of vulnerability to injury in response to movement. The advancement of acute pain to persistent and chronic pain occurs as a result of decreased use of the painful area due to fear of an increase in pain as a result of movement. This fear of movement is termed kinesiophobia and is defined as an excessive, irrational, and debilitating fear of movement or physical activity. **Aim:** To study the correlation of residual limb pain and phantom limb pain with kinesiophobia in patients of amputation. **Relevance of study:** There are two types of pain experienced by the amputees post-amputation, primarily i.e., residual limb pain (RLP) and phantom limb pain (PLP). Residual limb pain (stump pain) is the pain arising from the residual part of the body. It is commonly a sharp, sticking, or pressure feeling that, although diffuse, is localized to the end of the residual limb. PLP is a painful or unpleasant sensation in the distribution of the lost or defective body part. Where the pain induces, the fear of movement is associated with a feeling of vulnerability to injury in response to movement. **Methodology:** In this correlational study, 30 participants experiencing RLP and/or PLP were selected according to inclusion and exclusion criteria. Evaluation of RLP and PLP was done using pain assessment on a numerical pain rating scale. **Result:** The present study resulted in a positive correlation between RLP and kinesiophobia with a correlation coefficient r = 0.7855 and a p-value <0.0001 (extremely significant), indicating that the correlation is significant, and a negative correlation between PLP and kinesiophobia with a correlation coefficient r = 0.4854 and a p-value <0.1159 (not significant). **Conclusion:** There was a positive correlation between RLP and kinesiophobia, i.e., when there was high RLP intensity, it was associated with greater kinesiophobia and vice versa.

Keywords: amputation, fear of movement, kinesiophobia, phantom limb pain, residual limb pain, stump pain

Introduction

An amputation is defined as the removal of a part or all of a limb of the body due to trauma, Vascular disease, Infection, Tumors, Neurological disorders, Congenital deformity etc [1]. There are two types of pain experienced by the amputees post amputation majorly i.e Residual limb pain(RLP) and Phantom limb pain (PLP).

Residual limb pain (stump pain) is the pain arising from the residual part of the body. It is commonly a sharp, sticking or pressure feeling that, although diffuse, is localized to the end of the residual limb [2]. Residual limb pain is usually severe immediately after amputation and subsides quickly with healing [3].

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Stump pain, is caused by a number of pathologies including vascular insufficiency, bony spurs, skin damage and neuromas. A neuroma is the bulbous tumour of a nerve ending that occurs following traumatic transection (such as during the primary amputation), or following traction-related nerve damage. Following dissection, the nerve fibre undergoes Wallerian degeneration distally and when re-growth occurs, the axon fibres and new Schwann cells grow in a disorganised fashion, colloquially termed "sprouting". This sprouting can result in a cluster of cells (the neuroma) at the distal end of the nerve stump which subsequently has the disposition to discharge spontaneously due to increased mechanical- and chemosensitivity. It is often this ectopic electrical activity that leads to the sensation of the electric shock like pain of which patients complaint [4].

PLP is a painful or unpleasant sensation in the distribution of the lost or deafferented body part. PLP varies in character from neuropathic-type descriptors such as sharp, shooting, or electrical-like, to more nociceptive-specific adjectives such as dull, squeezing, and cramping. It can be localized to the entire limb or just one region of the missing limb. The pathophysiology underlying phantom phenomena can be broadly categorized in terms of supraspinal, spinal, and peripheral mechanisms [5].

About 80% of amputees have functionally significant episodes of phantom or stump pain every year and may have almost constant, very low level, residual pain that they define as being over the threshold of non painful sensation. Seven hundred twenty-seven surveys were analysed, in a study in which 73.4% reported RLP and 70.5% of participants reported PLP [6]. There is no evidence that residual limb pain and phantom limb pain is caused by psychological disorders although stress and psychological disturbances can exacerbate the pain, it is considered to be physiological phenomena [7].

Where in the pain induces, the fear of movement is associated with feeling of vulnerability to injury in response to movement. The advancement of acute pain to persistent and chronic pain occurs as a result of decreased use of the painful area due to fear of increase in pain as a result of movement[8].This fear of movement is termed as kinesiophobia, and is defined as an excessive irrational and debilitating fear of movement or physical activity.

Kinesiophobia includes three components - Threatening stimulus, Increased Sympathetic Arousal and Defensive behaviour. Two major events are expected to develop kinesiophobia. Past experience of pain or trauma: Having a painful experience in past associated with pain followed by a specific activity, Social learning and observation: developing a thinking of movement related pain by observing others having a painful experience [9].

Atar, Demir et.al in the year 2021-2022 conducted a study on Kinesiophobia and associated factors in patients with traumatic lower extremity amputation resulted that the greater kinesiophobia is correlated with higher RLP intensity [10].

Therefore, the current study was focused to see correlation of RLP and PLP with kinesiophobia.

Materials and Methods

A observational study was conducted on thirty participants with RLP and/or PLP at Dr. Ulhas Patil Medical College and Hospital, Jalgaon. Criteria for inclusion was 1. Individuals with age of 18 years and above with amputation. 2. amputation patients having phantom and / or residual limb pain. 3. Beck Depression Inventory scale (≤16) Able to give response properly. 4. Who are willing to participate.

Exclusion criteria was 1.Not having phantom and / or residual limb pain. 2. Beck Depression Inventory scale (more than 16). 3. Any recent psychological disturbances. 4. Recent trauma to the amputed limb. 5. Patients with speech and audible disturbances. 6. Not willing to participate. 7. Patients with cognitive impairments.

Procedure

Ethical clearance was obtained from Institutional Ethical Committee of Dr. Ulhas Patil College of Physiotherapy. A written informed consent form was obtained from who were willing to participate. Subject was screened according to inclusion and exclusion criteria. The aim of the study and its objective was explained to willing participants.

Patients were taken individually and were explained about the study and given information about how the study is.

Initially, the patients were screened by Beck depression inventory scale.

If the score of BDI-II scale was ≤16 then the individual was assessed for residual limb pain and phantom limb pain and was quantified by using Numerical Pain Rating Scale.

If the patient had residual limb pain and/or phantom limb pain then by using Tampa scale the patient was screened for kinesiophobia and the score was noted.

Data was collected and statistically Analysed.

Fig 1: Evaluation of amputee patient for RLP, PLP and kinesiophobia

Result

A total of 30 participants were included in the study. The data was obtained from the participants and statistically analysed

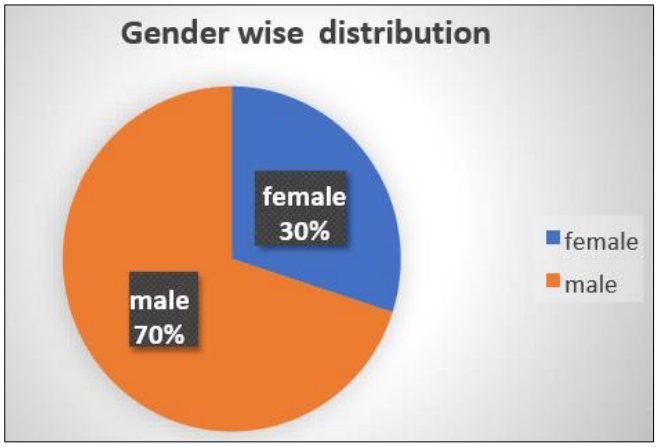
in MS Excel.

Table 1: Mean and standard deviation of the variables

Variable	Mean	Standard deviation
AGE	53.9	14.28
TSK-11	32.06	6.0
RLP	4.14	2.13
PLP	3.9	2.42
BDI-II	10.6	2.73

Table 2: Gender Wise Distribution

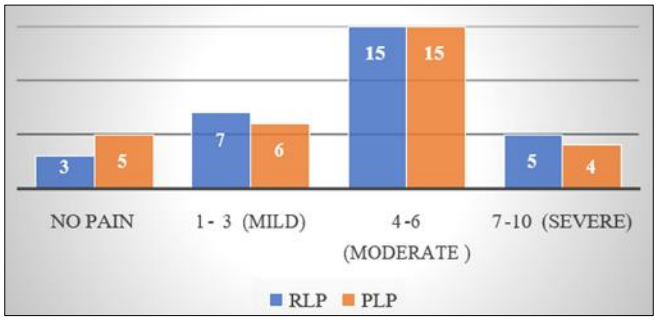
Total	Male	Female
30	21	9



Graph 1: Gender Wise Distribution

Table 3: Worst pain in last 24 hours (NPRS SCORE)

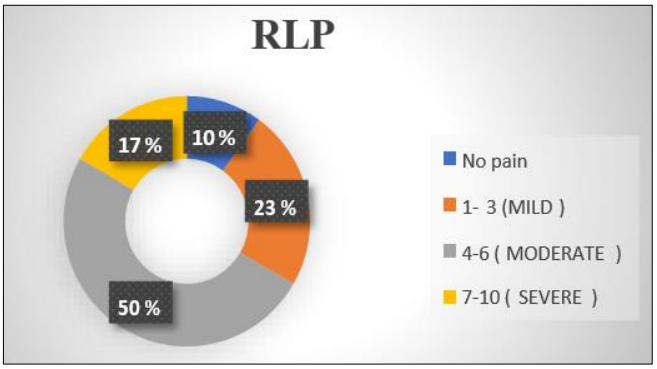
	No pain	1- 3 (Mild)	4-6 (Moderate)	7-10 (Severe)
RLP	3	7	15	5
PLP	5	6	15	4



Graph 2: Worst pain in last 24 hours (NPRS SCORE)

Table 4: Percentage of worst RLP in last 24 hours (NPRS SCORE)

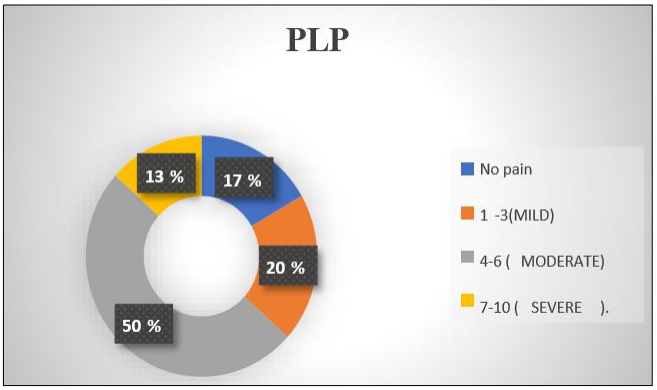
	No pain	1- 3 (Mild)	4-6 (Moderate)	7-10 (Severe)
RLP	10%	23%	50%	17%



Graph 3: Percentage of worst RLP in last 24 hours (NPRS SCORE)

Table 5: Percentage of worst PLP in last 24 hours (NPRS SCORE)

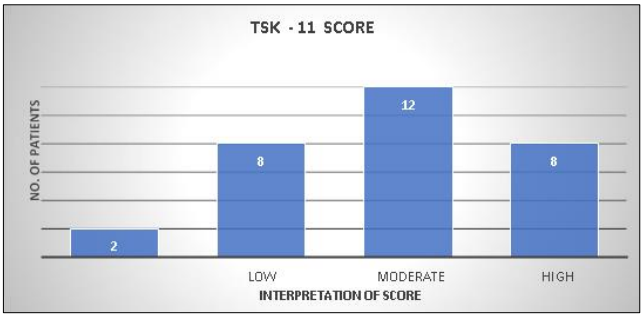
	No pain	1- 3 (MILD)	4-6 (MODERATE)	7-10 (SEVERE)
PLP	17%	20%	50%	13%



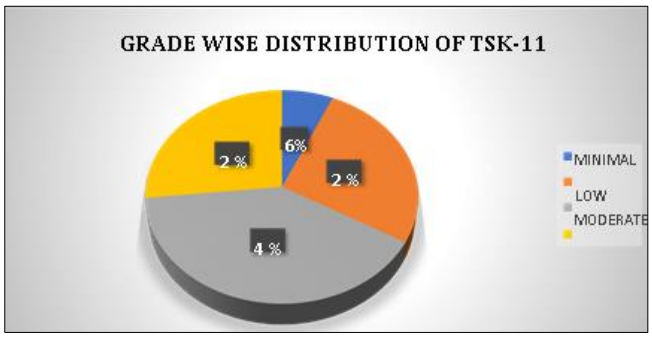
Graph 4: Percentage of worst PLP in last 24 hours (NPRS SCORE)

Table 6: Interpretation of TSK-11 score

Interpretation of Score	No. of Patients
Minimal (Less than or equals to 22)	02
Low (23 to 28)	08
Moderate (29 to 35)	12
HIGH	08
(More than or equals to 36)	



Graph 5: Interpretation of TSK-11 score

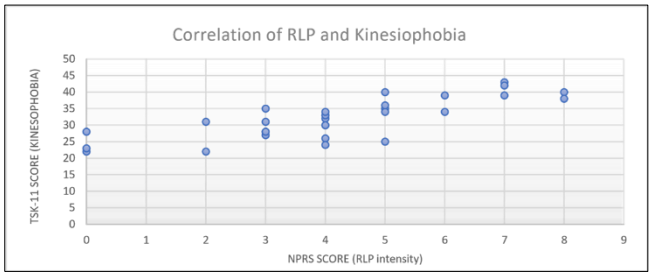


Graph 6: Grade wise distribution of TSK-11

Table 7: Pearsons coefficient Test for RLP

Correlation coefficient (r)	0.7855
P-value	<0.0001 (extremely significant)

* Correlation is positive and significant

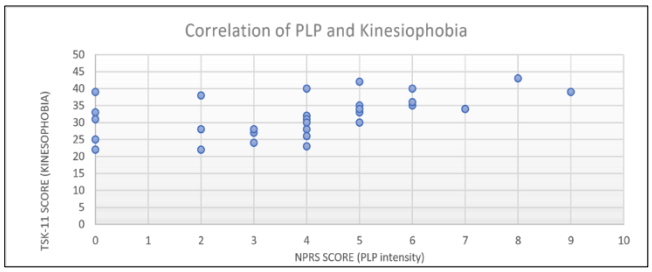


Graph 6: Correlation of RLP and Kinesiophobia

Table 8: Pearsons coefficient Test for PLP

Correlation coefficient (r)	0.4854
P-value	<0.1159 (not significant)

* Correlation is negative and not significant



Graph 6: Correlation of PLP and Kinesiophobia

Discussion

The present study was aimed to see the correlation of residual limb pain and phantom limb pain with kinesiophobia in patients of amputation.

10% patients (3) reported for no pain, 23%(7) for mild pain,50%(15) for moderate pain and 17%(5)for severe pain for RLP.

17%(5)patients reported for no pain, 20%(6) for mild pain, 50%(15) for moderate pain and 13%(4) for severe pain for PLP respectively.

In the present study the mean and standard deviation of worst possible score in last 24 hours of NPRS was 4.14±2.13 for RLP and 3.9±4.12 for PLP.

Out of 30 patients, 2 had minimal kinesiophobia, 8 had low kinesiophobia, 12 had moderate kinesiophobia and 8 had severe kinesiophobia on TSK-11 scale corresponding to 6%, 27%, 40% and 27% respectively.

The present study resulted that their is a positive correlation between RLP and kinesiophobia with correlation coefficient r =0.7855 and p-value <0.0001(extremely significant) indicating that the correlation is significant.

Atar, Demir et.al in the year 2021-2022 conducted a study on Kinesiophobia and associated factors in patients with traumatic lower extremity amputation resulted that the greater kinesiophobia is correlated with higher RLP intensity which coincides with current study [12].

This could be due to the pathophysiology of residual limb pain resulting due to neuromas. The neuromas gets activated mechanically and chemically and send.

continuous nociceptive stimulus leading to the pain in residual limb more distally.

According to fear avoidance model by Lethem *et al.* (1983) the fear of eliciting pain can occur due to stimulus such as previous experience, information or observation. According to this model, a person can develop the fear of performing certain activities if he has experienced similar pain while or during performing those activities in the past, or has been told by someone that, such activities may elicit pain. It can also occur if he has seen some other person experiencing pain while or after performing the similar activities. Therefore, the person starts anticipating the pain without performing activity and develops fear, which leads to kinesiophobia [9].

In present study also found that their is a negative correlation between PLP and kinesiophobia. Correlation coefficient r=0.4854 and p-value <0.1159(not significant).

This could be due to the mechanism of PLP supported by the central nervous system brain level cortical mechanism which states that extent of cortical reorganization has been found to be directly related to the degree of pain and the size of the deafferented region i.e. more the cortical reorganization more will be the phantom pain experienced by the patient [15].

The psychogenic mechanism of PLP states that PLP is more associated with psychological factors such as stress, anxiety and depression [15]. May be therefore, in the current study the kinesiophobia was correlated with RLP and not with PLP.

Conclusion

There was a positive correlation between RLP and kinesiophobia i.e. when there was high RLP intensity it was associated with greater kinesiophobia and vice-versa.

Limitation

Small sample size was taken. No follow up was done.

Clinical Implication

RLP is a cause of concern as the present study revealed that greater kinesiophobia is associated with high RLP intensity. So, if RLP left untreated can lead to more harm to the patients. Hence, early screening of RLP is pre-requisite for healthy quality of life.

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Conflict of Interest

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

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